

# PATENT COOPERATION TREATY

# PCT


## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 23 JAN 2006

PCT

Applicant's or agent's file reference LU6151	<b>FOR FURTHER ACTION</b>		See Form PCT/PEA/416
International application No. PCT/EP2004/014253	International filing date ( <i>day/month/year</i> ) 15.12.2004	Priority date ( <i>day/month/year</i> ) 19.12.2003	
International Patent Classification (IPC) or national classification and IPC C08F10/02, C08F4/69, C07F17/00			
Applicant BASELL POLYOLEFINE GMBH et al.			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 11 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p style="margin-left: 20px;">a. <input type="checkbox"/> <i>sent to the applicant and to the International Bureau</i> a total of sheets, as follows:</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> <i>(sent to the International Bureau only)</i> a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input checked="" type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input checked="" type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand  22.06.2005		Date of completion of this report  24.01.2006	
Name and mailing address of the international preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized Officer  Parry, J  Telephone No. +31 70 340-	



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**Box No. I Basis of the report**

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1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements**\* of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

**Description, Pages**

1-60 as originally filed

**Claims, Numbers**

1-9 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

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**Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

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1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:
- ☐ the entire international application,
  - ☒ claims Nos. 1-9 (in part)  
because:
    - ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):
    - ☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):
    - ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
  - ☒ no international search report has been established for the said claims Nos. 1-9 (in part)
  - ☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:
    - the written form ☐ has not been furnished
    - ☐ does not comply with the standard
    - the computer readable form ☐ has not been furnished
    - ☐ does not comply with the standard
  - ☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.
  - ☐ See separate sheet for further details

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**Box No. IV Lack of unity of invention**

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1. ☒ In response to the invitation to restrict or pay additional fees, the applicant has:
- ☐ restricted the claims.
  - ☐ paid additional fees.
  - ☐ paid additional fees under protest.
  - ☒ neither restricted nor paid additional fees.
2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is
- ☐ complied with.
  - ☒ not complied with for the following reasons:  
**see separate sheet**
4. Consequently, this report has been established in respect of the following parts of the international application:
- ☐ all parts.
  - ☒ the parts relating to claims Nos. 1-9 (in part) .

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	3-5 (in part)
	No: Claims	1-2,6-9 (in part)
Inventive step (IS)	Yes: Claims	
	No: Claims	1-9 (in part)
Industrial applicability (IA)	Yes: Claims	1-9 (in part)
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**Re Item III**

**Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

According to the ISA, only the following subject matter has been searched:

1. Group 1: the subject matter of claims 1-9 (in part) insofar as M<sup>A</sup> is titanium and A is a group 15 atom (special technical feature 1).
2. Group 5: the subject matter of claims 1-9 (in part) insofar as M<sup>A</sup> is a group 6 metal and A is a group 15 atom (special technical feature 5).
3. Group 12: the subject matter of claims 1-9 (in part) insofar as M<sup>A</sup> is a group 6 metal and A is a group 16 atom

All other subject matter of the present application has not been searched and therefore only the above mentioned subject matter under point 1 can be the subject of examination (Rule 66.1(e), Art. 17 (3) PCT (see Box IV (unity of invention))).

**Re Item IV**

**Lack of unity of invention**

The present application is found to contravene the requirements of unity of invention according to Art. 3(4)(iii) PCT, Art. 34 (3)(a) PCT and Rule 13 PCT for the following reasons: the general concept underlying the claims of the application is the use of an olefin polymerisation catalyst according to claim 1. This concept is well known (see D1: Döhring et al, XP001125762, p.390, example 24 in table 1; p.396, second full paragraph; p. 397, tables 5 and 6).

The anticipating character of the disclosure D1 resides in a monocyclopentadienyl complex of chromium with Z of present claim 1 being a SiMe<sub>2</sub>-O-SiMe<sub>2</sub> linker and A being a neutral nitrogen atom as part of a 5-membered ring:  
(Cp-SiMe<sub>2</sub>-O-SiMe<sub>2</sub>-cycloC<sub>4</sub>H<sub>8</sub>N)CrCl<sub>2</sub>.

Thus, the following inventions 1-14 each exhibit a different present special technical feature over D1. The effect of each of the special technical features 1-14 below has not been demonstrated over D1, and it is therefore not possible to derive a technical effect over D1 related to each of the different special technical features described below.

Therefore, the objective problem to be solved in each case can only be formulated as to provide alternative catalysts for the production of olefin polymers. Each alternative

provides a contribution over the prior art as represented by D1 for solving the problem of producing said polymers:

1. Group 1: the subject matter of claims 1-9 (in part) insofar as M<sup>A</sup> is titanium and A is a group 15 atom (special technical feature 1).
2. Group 2: the subject matter of claims 1-9 (in part) insofar as M<sup>A</sup> is zirconium and A is a group 15 atom (special technical feature 2).
3. Group 3: the subject matter of claims 1-9 (in part) insofar as M<sup>A</sup> is hafnium and A is a group 15 atom (special technical feature 3).
4. Group 4: the subject matter of claims 1-9 (in part) insofar as M<sup>A</sup> is a group 5 metal and A is a group 15 atom (special technical feature 4).
5. Group 5: the subject matter of claims 1-9 (in part) insofar as M<sup>A</sup> is a group 6 metal and A is a group 15 atom (special technical feature 5).
6. Group 6: the subject matter of claims 1-9 (in part) insofar as M<sup>A</sup> is a group 3 metal and A is a group 15 atom (special technical feature 6).
7. Group 7: the subject matter of claims 1-9 (in part) insofar as M<sup>A</sup> is a lanthanide metal and A is a group 15 atom (special technical feature 7).
8. Group 8: the subject matter of claims 1-9 (in part) insofar as M<sup>A</sup> is titanium and A is a group 16 atom (special technical feature 8).
9. Group 9: the subject matter of claims 1-9 (in part) insofar as M<sup>A</sup> is zirconium and A is a group 16 atom (special technical feature 9).
10. Group 10: the subject matter of claims 1-9 (in part) insofar as M<sup>A</sup> is hafnium and A is a group 16 atom (special technical feature 10).
11. Group 11: the subject matter of claims 1-9 (in part) insofar as M<sup>A</sup> is a group 5 metal and A is a group 16 atom (special technical feature 11).
12. Group 12: the subject matter of claims 1-9 (in part) insofar as M<sup>A</sup> is a group 6 metal

and A is a group 16 atom (special technical feature 12).

13. Group 13: the subject matter of claims 1-9 (in part) insofar as M<sup>A</sup> is a group 3 metal and A is a group 16 atom (special technical feature 13).

14. Group 14: the subject matter of claims 1-9 (in part) insofar as M<sup>A</sup> is a lanthanide metal and A is a group 16 atom (special technical feature 14).

The number of inventions reflects the effort required to fully search present claim 1 and is consistent with T110/82. Because the present application contains no restriction to group 6 transition metals in accord with the present worked examples, present claim 1 represents an extremely broad range of complexes possessing many different metals per se for which no restriction according to any use can be applied to aid the search. This is particularly true for the metals of group 4 of the periodic table where the type of ligation according to formula (I) of present claim 1 is most common and where grouping of congeners of the periodic table into one search group would yield an excessive examination effort, as evidenced by the number of anticipations in the partial search report of the "invitation" for titanium alone. Moreover, no ancillary ligation such as a monoanionic halide or hydrocarbon group X has been specified for the metal such that any kind of ligand in addition to (I) can be also be present, nor indeed has the number of ligands (I) even been restricted to one, in accord with the worked examples. Furthermore, the connectivity of Z has not been specified so that many possible combinations of atoms can give rise to Z falling under present claim 1, exacerbating the problems outlined above.

All these groups above are linked by the common concept as defined above, however, in the light of D1 this feature is not special and there is therefore no single general inventive concept (Rule 13.1 PCT).

Each of the special technical features 1-14 above is different and since they do not lead to the same effect (that is, it has not been demonstrated in the present application that they lead to the same effect), the special technical features are not corresponding either. Hence, no same or corresponding special technical features can be identified amongst the different inventions 1-14 that can link them (Rule 13.2, PCT). Thus, the requirements of Rule 13.1 and 13.2 PCT are not met, and the application lacks unity of invention.



**Re Item V**

**Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

The following documents (D1-D7) will be referred to (see the ISR for the relevant passages):

- D1: DOEHRING, A. ET AL: "Donor-Ligand-Substituted Cyclopentadienylchromium(III) Complexes: A New Class of Alkene Polymerization Catalyst . 1. Amino-Substituted Systems" ORGANOMETALLICS , 19(4), 388-402 CODEN: ORGND7; ISSN: 0276-7333, 2000, XP001125762
- D2: JIMENEZ, GERARDO ET AL: "Cyclopentadienyl-Amido Ligands with a Pendant "-NHR" Amino Functionality in Titanium Chemistry. Molecular Structure of [Ti{.eta.5-C5H4SiMe2-.eta.-N(CH2)2-.eta.-N HCHMe2}Cl2]" ORGANOMETALLICS , 21(11), 2189-2195 CODEN: ORGND7; ISSN: 0276-7333, 2002, XP008043937
- D3: DATABASE CA [Online] CHEMICAL ABSTRACTS SERVICE, COLUMBUS, OHIO, US; IWASE, KATSUHIRO: "Preparation of ethylene-styrene copolymer and its polymerization catalysts containing Group IVB metal complexes" XP002319944 gefunden im STN Database accession no. 1999:463297
- D4: EP-A-0 852 230 (SUMITOMO CHEMICAL COMPANY LIMITED) 8. Juli 1998 (1998-07-08)
- D5: WO 02/16374 A1 (BOREALIS TECHNOLOGY OY, FINLAND; CAMPBELL, NEIL) 28. Februar 2002 (2002-02-28)
- D6: WO 01/12641 A1 (BASF AKTIENGESELLSCHAFT, GERMANY) 22. Februar 2001 (2001-02-22)
- D7: WO 01/92346 A2 (UNION CARBIDE CHEMICALS & PLASTICS TECHNOLOGY CORP., USA) 6. Dezember 2001 (2001-12-06)

1. D1, considered the closest prior art, describes amongst others, the complex (Cp-SiMe<sub>2</sub>-O-SiMe<sub>2</sub>-cycloC<sub>4</sub>H<sub>8</sub>N)CrCl<sub>2</sub>, which is employed in the polymerisation with MAO of ethylene. Hence claims 1,2,6-9 are not novel.

2. D2 describes the complex (Cp-SiMe<sub>2</sub>-NH-CH<sub>2</sub>CH<sub>2</sub>-NH(iPr))TiCl<sub>2</sub>. It has no catalytic role. The unit bridging the Cp ring and the neutral donor contains an amido donor also

coordinated to metal, but nevertheless this structure falls under the scope of present claims 1 and 2, hence these claims are not novel.

3. D3 describes amongst others, the complex  $(\text{Cp-NH-Ph-PPh}_2)\text{TiCl}_2$  with a phenylene bridge, which is employed in the polymerisation with MAO of olefins. Hence claims 1,2,6-9 are not novel.

4. D4 describes amongst others, the complex  $(\text{Cp-S-Ph-OSiMe}_3)\text{Ti}(\text{NR}_2)_3$  which is employed in the polymerisation with MAO of olefins. Hence claims 1,2,6-9 are not novel.

5. D5 describes amongst others, the complex  $(\text{Cp-SiMe}_2\text{-NC}_3\text{N-C}_3\text{N})\text{CrCl}_2$  in which the neutral N donor is part of a double bond in a fused ring system comprising one other non-coordinating nitrogen. The compound is employed in the polymerisation with MAO of olefins. Hence claims 1,2,6-9 are not novel.

6. The subject matter of claims 3-5 of the present application is not considered inventive for the following reasons: D1, which is considered to be the closest prior art, describes the above-mentioned catalysts. The subject-matter of claims 3-5 differs as a whole in that different bridging units having alternative connectivity (feature 1) linked to different substituents bearing a neutral nitrogen donor atom are used (feature 2). The technical effect of these features has not been demonstrated over D1. Therefore, the objective problem can only be formulated as to provide alternative cocatalysts for olefin polymerisation. The solution proposed in claims 3-5 of the present application cannot be considered as involving an inventive step because feature 1 is a trivial modification to make and feature 2 is also trivial (and in any case is disclosed in D6 and D7 in the form of quinolyl and pyridine substituents). The skilled person would regard it as a normal option to vary these substituents at the cyclopentadienyl ring in this way.

#### **Re Item VIII**

#### **Certain observations on the international application**

The following objections are made under Art. 6 (PCT):

1. Claim 2:  $n+m$  cannot equal 4 for metals that are maximally trivalent.
2. Claim 3: (i) R cannot exist as a substituent for the case where E is a P atom in the ring. Also, "cyclopentadienyl" is normally construed in the art to mean an all-carbon

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framework. Those comprising heteroatoms are normally specified as so in the nomenclature.

(ii) This claim cannot depend on claim 1, as no carbene has been specified. Furthermore, carbenes would not normally be construed by the skilled person to fall under the scope of "donors", even though they may function in that way. One normally thinks of heteroatoms only in this sense.

3. Claim 4 cannot depend on claim 3 as  $E = N$  has not been defined there. The objections under point 2 above also apply here.

4. Claim 6: "...further catalysts suitable..." is vague and in any case describes a "result to be achieved" (PCT GL Ch.-III,4.7).